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FOREST INSECT INVESTIGATIONS

TIP MOTH INFESTATION
ASHLAND DIVISION - CUSTER NATIONAL FOREST
1936

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Excessive damage to ponderosa pine terminals was reported by Regional Forester Kelley in June 1936, and samples of the material forwarded to this laboratory. Though Major Kelley assumed the injury to have been caused by tip moths, the agency responsible could not be determined, as the samples contained no injured 1936 growth. An additional shipment of material was received in July, which permitted a positive determination of tip moth, Rhyacionia sp., injury to the 1936 terminals. The writer visited the Ashland division of the Custer Forest on August 22nd and examined a number of areas where ponderosa pine trees were being seriously injured by these insects.

The Ashland division of the Custer Forest has been subjected to four very dry years. It is unfortunate that weather records are not available from some point near the Ashland division, which necessitated the use of Miles City records as the nearest index available. From 1933 to 1935 the departures from a normal precipitation of 13.79 inches at Miles City were -3.57, -8.28, and -2.25 inches respectively. However, they can be taken as an indication of deficient rainfall throughout the general area. Though complete data for the 1936 season are not available, it is known that conditions were equally as bad if not worse than during the three previous years. During the period

from January to September inclusive the total precipitation was only 4.77 inches, which is 8.44 inches below the yearly normal. These data must not be taken as indicating the actual precipitation on the Ashland division, as it is fully appreciated that Miles City records depict only the conditions for that immediate territory. As a result of this period of drought it is evident that all forest crops have been growing under adverse conditions, which is reflected in the loss of tree resistance to insect attack.

In addition to this period of dry years, the 1936 season presented a scourge of grasshoppers which swept over the entire region, destroying every vestige of green in sight. Smaller and more localized outbreaks of Mormon crickets occurred in several parts of the forest, adding, if possible, to the destruction wrought by grasshoppers. The combined effects of the drought and the grasshoppers left fields, forest meadows, and park in a dry, burned condition, devoid of all green forage. So thoroughly were the more favored food plants destroyed that the grasshoppers had been forced to feed upon ponderosa pine foliage. So severe was this abnormal defoliation that around the edges of forest parks, and extending back into the forest in some instances for several hundred feet, ponderosa pine trees varying from small reproduction to trees 20 feet or more in height had been stripped of foliage. The needles had been eaten down to within one-half inch or less of the limbs, and as myriads of the pests were still present, it was obvious that additional feeding would occur. Though grasshoppers have been reported as feeding upon small trees in forest plantations,

this is the first available record of serious injury to large trees. Ranger Morrison stated that the Mormon crickets also feed upon pine foliage of smaller trees. Though I did not observe this condition at the time of my visit, we have records of these insects climbing rather fair-sized lodgepole pine presumably for feeding (Gibson 1936). Though one can not accurately predict the final results of the combined effects of drought and defoliation by grasshoppers as well as tip moth injury, one can expect considerable mortality to occur.

In all of the areas visited within the Ashland division of the Custer Forest the work of tip moths (Rhyacionia sp.) was encountered. In some areas it was especially severe, while in others, though present, it was not so severe. Though ample evidences of 1936 injury were present, only a limited number of insects was collected. From this small collection, which was determined by Mr. Baumhofer, Forest Insect Laboratory, Fort Collins, Colorado, it appears that two species of tip moths (Rhyacionia frustrana bushnelli and neomexicana) are present in this area, though adult insects have not been secured for a positive determination.

Mr. Baumhofer writes of the seasonal history of these insects as follows*:

"A single generation (Rhyacionia neomexicana) occurs annually. The adult moths emerge early in the spring, with the peak of emergence occurring in late April in normal years. * * * * The eggs are deposited

*Report on the Insect Situation and Experiments in the Nebraska National Forest During 1933.(Unpublished manuscript.)

*The Pine Tip Moth in the Nebraska National Forest. Jour. of Agri. Res. Vol. 35, No. 4.

in groups of from 2 to 10, occasionally as many as 19, placed in one or two rows on the inner surface of the needles just above the bundle sheath. The incubation period varies from 10 to 27 days, depending upon temperature conditions. * * * * Many of the young larvae bore into the base of the developing needles before entering the shoot. The new shoot is usually attached at the apex, but in some instances the larvae start from 1 to 3 inches below the tip, working down through the shoot as they develop. Most of the shoots are fully elongated before serious injury occurs; however, full growth may be prevented in slow-growing adventitious shoots. The amount of injury to individual shoots depends on the number of larvae present. * * * * The mature larvae crawl down the bole of the tree (July) and spin their cocoons in bark crevices at the ground line below the litter, transforming to pupae in about ten days. The winter is passed in the pupal stage, adults emerging the following spring.

"Adult Rhyacionia frustrana bushnelli emerge early in the spring, the date of emergence varying from year to year, depending upon the weather. * * * * Eggs are usually laid singly, but occasionally in groups of two or three. They are deposited either on the needles, the leaf sheaf, the bud scales, or the tips; the usual place, however, is on the inner side of a needle. * * * * The young larva soon after hatching spins over the spot where it is feeding a thin protective web, which it coats with resin. This web is always located on a new tip, usually at the base of a needle or the base of a bud. Some times the larva works on the surface of the stem

beneath its web. * * * * Later it burrows either into a bud or into the succulent growth of a new tip. * * * * Under the most favorable conditions the length of the larval stage appears to be not less than three weeks. When fully developed, each larva of the spring generation spins a light silken cocoon inside its burrow and thus passes through the pupal stage. * * * * Adults of the summer generation begin to appear during the later part of June. * * * * Owing to greater abundance, the summer generation causes much greater injury to the trees than the spring generation. The habits of the larvae, however, are practically the same. * * * * , the cocoons of the second generation are not spun in the tip, as is the case with the spring generation, but the larvae, when full grown, drop to the ground, and in the litter under the trees or just beneath the surface of the sand spin their cocoons and transform to pupae."

Tip moths are seldom responsible for the death of trees, though obviously when all of the tips are destroyed for several years death will follow. Furthermore, when tip moth injury is associated with such complicating factors as drought and grasshopper defoliation, the percent of mortality is increased, though under such circumstances it is difficult to isolate the primary agency. There are several spots of dead trees which while living were severely injured by tip moths, though the injury could well be secondary to drought.

The effects of tip moth injury are reflected in the stooling of the limb tips and leaders, which produce dwarfed and deformed trees. The presence of the tip moth in the Custer National Forest is not a new infestation, though it is possible that the effects of its work

may have become more serious during the past dry seasons. Old records show that tip moth damage was reported from the Sioux National Forest (now Custer) in 1911. Tip moth material was received at this laboratory from the Long Pine division in 1921, and from the Ekalaka and Long Pine divisions in 1934. Though we have no earlier records of tip moth damage within the Ashland division, there is no reason to assume these insects have not been present for many years. Furthermore, the past evidence of their work can be seen in the forked and crooked trees which are present throughout the area.

The absence of overwintering pupae during this examination can perhaps be explained by abnormal larval mortality due to the extremely hot, unfavorable weather which occurred in June and July. Mr. Baumhofer reports the occurrence of a heavy mortality in the second generation of R. frustrana bushnelli as a result of extremely high temperatures in the Nebraska National Forest during July 1934.

It is regretted that at this time there are no feasible methods of control which could be recommended for the abatement of tip moth damage on the Custer Forest. The future effects of the infestation will no doubt be a continuation of what has occurred in the past, as it is believed that the increased damage which seems apparent at this time is perhaps due more to drought than to tip moths. If this premise be correct, future timber crops can be produced which will be comparable to those which now stock the forest.

Respectfully submitted,

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Ponderosa Pine Trees Defoliated by Grasshoppers - Ashland Division, Custer National Forest 1936

Typical Tip Moth Injuries to Ponderosa Pine Trees - Ashland Division, Custer National Forest - 1936.

Tip Moth Injury to 1936 Growth of
Ponderosa Pine - Ashland Division,
Custer National Forest - 1936.

Tip Moth Injury to 1936 Growth of
Ponderosa Pine - Ashland Division,
Custer National Forest - 1936.